INCIDENT

Aircraft Type and Registration:	Jetstream 4100, G-MAJM
No & Type of Engines:	2 Garrett Airesearch TPE331-14GR-805H turboprop engines
Year of Manufacture:	1996
Date & Time (UTC):	23 February 2005 at 1245 hrs
Location:	Climbing to cruising level from Aberdeen, Scotland
Type of Flight:	Public Transport (Passenger)
Persons on Board:	Crew - 3 Passengers - 7
Injuries:	Crew - None Passengers - None
Nature of Damage:	None
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	37 years
Commander's Flying Experience:	7,100 hours (of which 200 were on type) Last 90 days - 160 hours Last 28 days - 71 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

While climbing through 9,000 feet on a scheduled passenger flight from Aberdeen to Newcastle, the aircraft experienced a sharp pitch change as the autopilot was engaged. When the autopilot was disengaged, pitch control was found to be very limited. Control improved during the descent for a precautionary landing at Aberdeen, and was completely restored upon touchdown. The captain believes that failure to ensure proper de-icing prior to departure had permitted ice to remain on the horizontal tail surfaces and that a further accumulation in flight caused the elevator to become jammed.

History of the flight

The aircraft had been parked outside throughout the previous night, during which snow had fallen. Visible accumulations of ice were removed from the aircraft in the morning, but no de-icing fluid was applied and the horizontal tail surfaces were not inspected or treated for ice by any other means.

The captain stated that he made a visual pre-flight inspection of the aircraft, but was not able to see the top surface of the tailplane. Nevertheless, the flying controls were found to have full and free movement in all axes when checked prior to departure in accordance with normal procedures.

The airfield weather report at the time of departure indicated cloud scattered at 1,500 and 2,500 feet, with a surface temperature of 1ºC and dew point -3ºC. The runway was dry. The takeoff, with ice protection systems selected OFF, was uneventful. All ice protection systems were then selected ON as the aircraft entered cloud at approximately 2,000 feet, and ice was detected as the aircraft climbed though 7,500 feet. The aircraft climbed clear of cloud as it passed 8,000 feet, and the first officer continued to fly it manually until passing 9,000 feet, without encountering any unusual handling characteristics. However, when the autopilot was engaged, the aircraft made a sharp pitch change. The first officer disengaged the autopilot and attempted to control the aircraft manually, but found that the control column was severely restricted in pitch, with only limited nose-up control. When the captain attempted to fly the aircraft, he discovered that he had slightly more control, possibly because he was physically stronger than the first officer.

Elevator control

Each half of the elevator is controlled by an independent cable and rod system connected to its respective control column in the cockpit. In normal operation, the two systems act together because the control columns are mounted on a common torque tube. In the event of restricted movement, the two halves can be disconnected by pulling a manual disconnect handle, enabling each system to operate independently. The pilots decided not to pull the disconnect handle because the captain found that he was able to exercise adequate pitch control by using the elevator trim control. The crew declared a PAN and returned to Aberdeen, requesting radar vectors for a long and shallow approach. The captain regained greater pitch control as the aircraft descended, and full control authority was restored prior to the uneventful landing.

When the aircraft arrived on stand, ice was seen falling from the gap between the elevator leading edge and the fixed portion of the tailplane. A more detailed inspection, carried out when the aircraft was moved into a hangar, revealed that the space between the elevator leading edge and tailplane was filled with ice. No fault was found with the elevator hinge bearings, and no water was evident in the elevator actuating system.

Conclusion

The captain considers that, because no de-icing fluid was applied to the aircraft, ice which was not visible from the ground was present on the tailplane before takeoff. More water and ice accumulated

in the gap between the fixed tailplane and the elevator as the aircraft entered cloud, and froze completely as the aircraft climbed, preventing normal elevator operation. Manual disconnection of the two elevator control systems would not have helped to regain control, because both halves of the elevator were similarly affected.